

**REMARKS**

**I. Status of the Claims**

Claims 1, 11, 13, 14, 16, 18, and 20-27 are pending in this application. No claim is amended herein, and accordingly, no new matter is added.

Applicant thanks the Examiner for withdrawing all of the rejections issued in the previous Office Action.

**II. Rejection Under 35 U.S.C. § 103(a)**

**A. Claims 1, 11, 18, and 20-27**

The Examiner rejects claims 1, 11, 18, and 20-27 under § 103(a) as being unpatentable over Dennis (*Weather Modification by Cloud Seeding*, Academic Press, 1980) ("*Dennis*") in view of Kahan and Rottner et al. (*Guidelines for Cloud Seeding to Augment Precipitation*, ASCE, 1995) ("*Rottner*"), U.S. Patent No. 3,659,785 to Nelson et al. ("*Nelson*"), and U.S. Patent No. 4,362,271 to Montmory ("*Montmory*"). Office Action at page 2. Applicant respectfully disagrees and traverses the rejection.

"It is an understatement to say that people are confused about cloud seeding." *Dennis* at page ix. "It is very important that those considering implementation of cloud seeding for precipitation enhancement understand that the choice of a cloud seeding delivery system (aerial or ground based) and the accurate targeting of the cloud seeding effects is a complex and difficult problem." *Rottner* at page 100. These quotes show that the very references the Examiner cites to support obviousness explain that modification of cloud microphysics is challenging and complex. And nothing in the

references cited by the Examiner overcomes that difficulty to establish obviousness over the present claims.

Prior art references relied upon in a rejection "must be considered in its entirety, i.e., **as a whole**, including portions that would lead away from the claimed invention." M.P.E.P. § 2141.02 (VI)(emphasis added); see also *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360, 52 USPQ2d 1294, 1298 (Fed. Cir. 1999) ("There is no suggestion to combine, however, if a reference teaches away from its combination with another source."). "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994).

In the present Office Action, the Examiner fails to consider the prior art references as a whole, particularly the teachings in these references that teach away from the combination proposed by the Examiner. Rather, the Examiner provides only conclusory statements that are unsupported by the references themselves. Once the entire disclosures of the references are considered, it becomes clear that the Examiner has not met the burden of establishing a *prima facie* case of obviousness over the present claims. See M.P.E.P. § 2142.

For example, *Dennis* discusses the underlying physics of cloud formation processes, and surveys a number of different cloud seeding techniques. See, e.g., *Dennis* at pages 28-95 (Chapters 3 and 4). Yet, the Examiner barely mentions *Dennis* in the Office Action. The Examiner asserts that "Dennis teaches (pages 35-38, especially Fig. 3.4) the evidence of hygroscopic particles (NaCl, as per

claims 21 and 22) for the intended purpose of 'Triggering' cloud condensation nuclei formation, where NaCl particles are tested for the growth of cloud droplets." Office Action at page 2. These comments, however, provide a serious mischaracterization of *Dennis's* disclosure. The pages to which the Examiner refers merely apply physical principles "to simulate the formation of a cloud," wherein Figure 3.4 "shows the history of nuclei [NaCl] of different sizes as a parcel of air is cooled by an upward motion of  $0.15 \text{ m s}^{-1}$ ." *Dennis* at pages 35-36. There is no discussion whatsoever of an "intended purpose," particularly when NaCl is a known natural cloud condensation nuclei ("CCN"). See *id.* at page 21.

Regarding the "Triggering" step recited in present claims 1 and 11, the Examiner notes that "Dennis does not teach aircraft dispersion," and attempts to find that disclosure in *Rottner*. Office Action at page 2. The Examiner further states that *Rottner* "concede[s]" that dispersion of hygroscopic materials from aircraft "would take massive quantities of the particles." *Id.* (Applicant notes that *Rottner* actually states "large quantities." *Rottner* at page 92.) Yet, the Examiner fails to explain how such a requirement for "massive quantities" renders obvious the combination suggested by the Examiner.

Furthermore, the Examiner ignores *Rottner's* teaching that "[t]here has been **limited research** on the use of hygroscopic materials in programs designed to increase rainfall . . . **Use of such cloud seeding agents is, therefore, not common in operational cloud seeding programs.**" *Rottner* at page 92 (emphasis added). Uncommon use of cloud seeding agents suggests that a person of ordinary skill in the art would not find the necessary guidance to achieve the present claims. Moreover,

*Rottner* teaches that "the choice of a cloud seeding delivery system (aerial or ground based) and the accurate targeting of the cloud seeding effects is a **complex and difficult problem**." *Id.* at page 100 (emphasis added). *Rottner's* teachings hardly support the combination proposed by the Examiner.

Regarding the "Fattening" step recited in present claims 1 and 11, the Examiner asserts that "Nelson's use of hygroscopic materials lends motivation for the use of exothermic-hygroscopic chemical, in that Nelson et al teaches it to be known to use calcium chloride (as per claims 21 and 23)." Office Action at page 3. Applicant respectfully disagrees. Rather, when considered as a whole, *Nelson* teaches away from the present claims.

*Nelson* states that microencapsulation technology (i.e., encapsulating a particles with an "insoluble material") overcomes "[a]ll of the foregoing problems of weather modification by means of seeding agents." *Nelson* at col. 1, ll. 55-57 and col. 3, ll. 21-30. As discussed in Applicant's Reply dated August 6, 2009, *Nelson* discusses a variety of problems in using hygroscopic materials. See Reply at page 13. For example, *Nelson* states that the hygroscopic nature of seeding materials "inherently causes agglomeration and clumping in storage." *Nelson* at col. 1, ll. 25-32. Undesirable characteristics of "corrosive" chemicals (e.g., sodium chloride and calcium chloride), prompt *Nelson* to focus on urea "since it has the requisite hygroscopic properties in addition to being non-corrosive." *Id.* at col. 3, ll. 30-31. And *Nelson* teaches numerous benefits provided by microencapsulation, including "improved structural integrity, handling and flowability together with protection of the particles from splintering, clumping, premature water absorption and breakage during storage and

dispersal.” *Id.* at Col. 2, ll. 12-16. Notably, however, the present claims do not recite microencapsulated particles. Thus, contrary to the Examiner’s assertion, *Nelson* does not provide any guidance that would lead a person of ordinary skill in the art to combine *Nelson* with the other prior art in an attempt to arrive at the present claims.

Regarding the “Attacking” step recited in present claims 1, 11, and 18, the Examiner reiterates its argument from the previous Office Action that *Montmory* “discloses the use of a device . . . where ‘salts’ are sprayed into and at the base of clouds from an aircraft.” Office Action at page 3. *See also* Office Action dated April 9, 2009, at pages 3-4. Claims 1, 11, and 18 recite “at least one first endothermic-hygroscopic chemical and at least one second endothermic-hygroscopic chemical are **simultaneously** dispersed at mid-cloud level and at the cloud base” (emphasis added). Claims 11 and 18 further recite the **simultaneous** dispersion of glaciogenic chemicals and supercooled chemicals. As Applicant previously explained, *Montmory* fails to teach simultaneous dispersion of chemicals. *See* Reply at page 11. Rather, *Montmory* teaches an “aerial seeding procedure” that may be carried out “either in the clouds or at their base.” *Montmory* at Col. 4, ll. 56-59. *Montmory* says nothing about simultaneous dispersion of chemicals.

In addition, it should be noted that *Montmory* teaches “a liquid composition containing dimethyl sulfoxide [DMSO] as the principal ingredient.” *Montmory* at Abstract. *Montmory* explains that “DMSO has the capacity of forming hydrogen bonds” with water, and the “ability to keep the droplets in the supercooled state even at very low temperatures.” *Id.* at Col. 48-56. That disclosure would lead a person of ordinary skill in the art in another direction entirely, towards liquid droplets comprising

DMSO. The Examiner fails to explain why the skilled artisan would look to *Montmory* at all.

Further, regarding the "Attacking" step recited in the present claims, the Examiner asserts that "[b]y assuming the positive benefits of using the chemicals as described in Triggering and Fattening (as per claims 24 and 25, as urea is taught by *Nelson et al*), the Attacking portion of the claimed methods is thereby consolidated using the technique of *Montmory*." Office Action at page 3. Applicant again disagrees. What positive benefits is the Examiner referring to? As Applicant noted above, *Nelson* discusses undesirable characteristics of a number of chemicals. Regarding urea, *Nelson* teaches that "[n]on-corrosive seed agents, such as urea, are generally crystalline in nature . . . fragile, brittle or friable crystalline structures have not been considered to be effective." *Nelson* at Col. 2, ll. 36-41. The Examiner's rationale is thus vague and unsupported.

Regarding the "Enhancing" step recited in present claim 1, the Examiner asserts that "*Rottner et al* teaches supercooled chemicals (dry ice, as per claim 26) being dispersed 'usually above cloud level', leaving a variable teaching of dispersing at other levels, especially if the cloud is shallow (see page 96)." Office Action at pages 3-4. Applicant respectfully submits that this statement is yet another mischaracterization of the prior art. In fact, *Rottner* provides the following:

It is important to remember that the type of cloud seeding agent and delivery system used may dictate the type of aircraft that can be used. Dry ice or droppable AgI flares are usually dispense at cloud top. However this is only possible if cloud tops are fairly shallow such that the cloud seeding material can be dropped into cloud regions containing supercooled water (0 to -10°C), and the clouds are positioned such that proper targeting of the cloud seeding

effects are possible. On-top cloud seeding may allow the use of aircraft not fully de-iceable.

*Rottner* at page 96. As the above passage shows, *Rottner* teaches variation of the type of aircraft. This is further illustrated by *Rottner's* subsequent discussion of "Agl acetone wingtip generators," wherein seeding with silver iodide becomes more effective at higher levels in the cloud. *Id.* at page 97. The "Enhancing" step of present claim 1 recites dispersion "from aircraft below the cloud base." See, e.g., Applicant's claim 1. Applicant respectfully submits the Examiner's assertion that *Rottner* teaches or suggests dispersion below the cloud base is in error.

Regarding present claim 18, the Examiner reiterates many of the comments that Applicant showed above to be unfounded. See Office Action at pages 5-6. The Examiner further asserts that "as Montmory teaches the desire to prevent hail during the process of initiating rainfall, it would have been obvious to one skilled in the art . . . to have **simultaneously** combined the known cloud seeding techniques, **in any sequence** of Dennis, Montmory Nelson et al in insure the eruption of rain or to prevent hail." Office Action at page 5 (emphasis added). The Examiner appears to argue that a person of ordinary skill in the art could rearrange any of the variables disclosed in any of *Dennis*, *Montmory*, and *Nelson* "simultaneously" and "in any sequence" to achieve the present claims. That is not the proper standard of obviousness. Applicant respectfully reminds the Examiner that articulated reasoning with some rational underpinning must be provided to support the legal conclusion of obviousness. M.P.E.P. § 2142 (quotations and citations omitted).

Further, consideration of the reference as a whole shows that *Montmory* teaches away from the present claims. *Montmory* discusses various drawbacks to dispersing

"artificial condensation nuclei in the form of solid particles of hygroscopic products such as sodium chloride, calcium chloride. etc." *Montmory* at Col. 2, ll. 43-58. *Montmory* therefore teaches a different method designed "to considerably increase the population of midsized droplets . . . in the areas of accumulation, then to make these droplets stable." *Id.* at Col. 2, line 59 to Col. 3, line 4. To use sodium chloride and calcium chloride (see, e.g., present claims 22-24 and 27) a person of ordinary skill in the art would have to disregard *Montmory's* teachings.

The Examiner fails to establish a *prima facie* case of obviousness over present claims 1, 11, 18, and 20-27 for at least the reasons provided above. Accordingly, Applicant requests that the Examiner withdraw the rejection.

**B. Claims 13, 14, and 16**

The Examiner rejects claims 13, 14, and 16 under § 103(a) as being unpatentable over *Dennis* in view of *Rottner, Nelson, Montmory*, and U.S. Patent No. 3,568,925 to Lietzer ("*Lietzer*"). Applicant respectfully disagrees and traverses the rejection.

The Examiner applies the same arguments regarding "techniques" recited in present claims 1, 11, and 20 to reject claims 13, 14 and 16. Office Action at page 5. For the reasons discussed above, the rejections of claims 13, 14, and 16 are likewise in error and should be withdrawn.

Regarding present claim 13, the Examiner cites *Lietzer* as "tangentially" teaching "the technique of relocating a cloud." *Id.* According to the Examiner, "*Lietzer* shows the formation of a cloud 'enhanced' to make rain, and moved via prevailing winds to a

desired location.” *Id.* The Examiner ignores the fact that *Lietzer* teaches away from dispersion of particles into the atmosphere:

A relatively recent method in the ancient art of rain making which utilizes the natural hydrologic cycle involves various types of cloud-seeding to hasten condensation of the water in the atmosphere by means of nucleating particles. This approach, however, does not increase the volume of atmospheric water available. The present invention is directed to artificial modification of a different aspect of the natural hydrologic cycle.

*Lietzer* at Col. 1, ll. 14-21. Thus, *Lietzer* suggests that nucleating particles (i.e., CCN) do not successfully lead to rainfall. A person of ordinary skill in the art would therefore have to apply *Lietzer's* teachings in a contradictory manner, which does not support obviousness. Further, *Lietzer's* method comprises spreading carbon particles on the ocean surface to increase water evaporation via heat absorption. *Id.* at Col. 1, ll. 38-47. Thus, *Lietzer's* method is restricted to coastal regions and inapplicable to a variety of circumstances for which the present claims provide. See, e.g., present specification at pages 4-7.

Regarding present claim 14, the Examiner cites *Nelson* as purportedly teaching dispersion of fog “using flakes of hygroscopic chemicals (Col. 1, line 9-17), where fog evaporation equates to a cloud being raised, or reduced in its lower elevations, in the broadest reasonable interpretation, and therefore moved.” Office Action at pages 5-6. Applicant respectfully disagrees. The passage cited by the Examiner actually states that “various materials were capable of reducing vapor pressure to dispel fog; however, these materials did not operate sufficiently well in practice . . . .” *Nelson* at Col. 1, ll. 11-16. And *Nelson* further teaches that “[t]he failure of the prior art methods and agents adequately to achieve the desired fog dissipation was due to the hygroscopic

nature of the materials to be used as seeding agents." *Nelson* at Col. 1, ll. 25-28.

*Nelson* actually teaches the opposite of what the Examiner asserts, and thus teaches away from the combination proposed by the Examiner.

Regarding claim 16, the Examiner merely refers to previous arguments, asserting that "the claimed device [is] unpatentable due to the described methodology already cited and does not result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art." Office Action at page 6. Present claim 16 (depending, in turn, from claims 13 and 1) recites "[a] method of weather modification." As such, Applicant fails to understand the Examiner's comments regarding a "claimed device." *Id.* In addition, the rejection of claim 16 is in error for the same reasons discussed above regarding *Dennis*, *Montmory*, *Nelson*, and *Lietzer*.

For at least the foregoing reasons, Applicant submits that the Examiner fails to establish a *prima facie* case of obviousness over claims 13, 14, and 16, and respectfully requests that the Examiner withdraw the rejection.

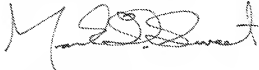
### **III. Conclusion**

Applicant submits that the rejections of claims 1, 11, 13, 14, 16, 18, and 20-27 are overcome by the foregoing remarks. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections and grant the timely allowance of all of the pending claims.

Please grant any additional extensions of time required to enter this response  
and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read 'M. Sweet', written over a horizontal line.

Dated: November 30, 2009

By: \_\_\_\_\_

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